WHAT IS CLAIMED IS:

1. An arithmetic operation unit for multiplying α^i when an element of G(X) = 0 of a primitive polynomial G(X) on a Galois field) is represented by α, comprising:

a shift operating section for shifting elements by i bits before multiplication; and

a referring section for referring to a look-up table of 2^i pieces of elements when the multiplier of α is represented by i,

wherein the element of G(X) = 0 of the primitive polynomial G(X) on the Galois field is represented by the following expression:

$$G_{(x)} = g_m x^m + g_{m-1} x^{m-2} + g_{m-2} x^{m-2} + \cdots\cdot + g_{p+1} x^{p+1} + g_p x^p + \cdots\cdot + g_0 .$$

2. An arithmetic operation unit for calculating $U \cdot \alpha^i$ based on an element U on a Galois field represented by the following expression:

$$U = \alpha^n u_n + \alpha^{n-1} u_{n-1} + \cdots + \alpha^2 u_2 + \alpha^1 u_1 + u_0 ,$$

when an element of $G_{(X)} = 0$ of a primitive polynomial $G_{(X)}$ on the Galois field is represented by the following expression:

$$G_{(x)} = g_m x^m + g_{m-1} x^{m-2} + g_{m-2} x^{m-2} + \cdots\cdot + g_{p+1} x^{p+1} + g_p x^p + \cdots\cdot + g_0 ,$$

is represented by α, wherein a shift operating section for shifting the element U by i bits is ExOred with a referring section for referring to a look-up table having 2^i pieces of elements according to the least significant i bits of U.

3. An arithmetic operation unit according to claim 2, wherein when data is represented by D_1, D_2, …, D_k, error check symbols E_0, E_1, E_2, …, E_{n-k-1} are calculated by the following expression:

$$
\begin{aligned}
&D_1+D_2+D_3+\cdots+D_{k-1}+D_k=E_0\\
&\alpha^{k}D_1+\alpha^{k-1}D_2+\alpha^{k-2}D_3+\cdots+\alpha^{2}D_{k-1}+\alpha D_k=E_1\\
&\alpha^{(k)^2}D_1+\alpha^{(k-1)^2}D_2+\alpha^{(k-2)^2}D_3+\cdots+\alpha^{4}D_{k-1}+\alpha^{2}D_k=E_2\\
&\qquad\vdots\qquad\qquad\qquad\qquad\qquad\qquad\vdots\\
&\alpha^{(k)^{n-k-1}}D_1+\alpha^{(k-1)^{n-k-1}}D_2+\cdots+\alpha^{n-k}D_{k-1}+\alpha^{n-k-1}D_k=E_{n-k-1}
\end{aligned}
$$

4. An arithmetic operation unit according to claim 3, wherein when data is decoded, symbols S_0, S_1, S_2, …, S_{n-k-1} are obtained by calculating the following expression:

5. An arithmetic operation unit according to claim 4, wherein when the magnitude of an error is determined using the symbols S_0, S_1, S_2, …, S_{n-k-1}, the magnitude of the error is determined by providing an inverse element reference table of the form:

a) α^1, α^2, ... α^k, and

b) $1 + \alpha^1$, $1 + \alpha^2$, ...$1 + \alpha^k$,

and by referring to the table.